Some notes from class

2018-03-14

Similarity (Sec 4.4)

Definition

Two polygons $P_1P_2\dots P_n$ and $Q_1Q_2\dots Q_n$ are said to be *similar* under the correspondence $P_i \leftrightarrow Q_i$ if:

1. $\angle P_i \cong \angle Q_i$ for all $i \in \{1, 2, \dots, n\}$
2. $\frac{P_1P_2}{Q_1Q_2} = \frac{P_2P_3}{Q_2Q_3} = \cdots = \frac{P_{n-1}P_n}{Q_{n-1}Q_n}$.

First step toward triangle similarity condition(s)

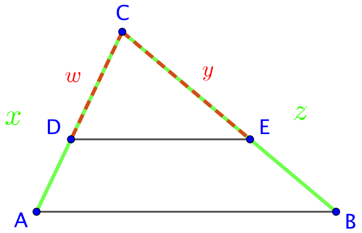
Theorem (Basic Proportionality Theorem)

Given $\triangle ABC$, *let* $D \in \overline{AC}$, *and let* $E \in \overline{BC}$ *with* $\overleftrightarrow{DE}$ *parallel to* $\overleftrightarrow{AB}$. *Then* $\frac{CD}{DA} = \frac{CE}{EB}$.

Corollary

In the above situation, $\frac{CD}{CA} = \frac{CE}{CB}$. (i.e. We claim that $\frac{w}{x} = \frac{y}{z}$ below.)

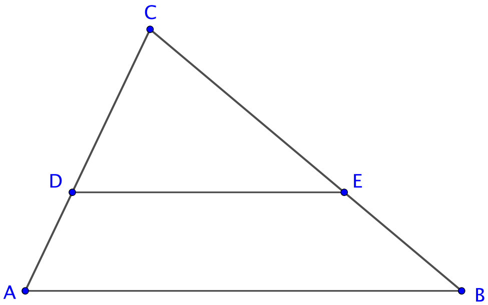
Idea. Previous theorem implies $\frac{w}{x-w} = \frac{y}{z-y}$. Thus $\frac{x-w}{w} = \frac{z-y}{y}$.



Other direction

Theorem (This is basically the converse of BPT)

In the given triangle, if $\frac{CD}{DA} = \frac{CE}{EB}$, *then* $\overleftrightarrow{DE}$ *is parallel to* $\overleftrightarrow{AB}$.



Our big goals

1. AAA similarity
2. SAS similarity
3. SSS similarity